

A MIND FOR  
**MATHEMATICS**

MEANINGFUL TEACHING AND LEARNING  
IN ELEMENTARY CLASSROOMS

NANCI N. SMITH

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# INTRODUCTION

Underpinning the learning revolution is a growing recognition that facing the challenges of the 21st century will require more than minor adaptations to current practice.

—Steven E. Jungst, Barbara L. Licklider, and  
Janice A. Wiersema

In my first year of teaching, I was accused of teaching *Mickey Mouse mathematics*. I knew then that I was different. You see, I disliked the text series I was supposed to follow, and I kept venturing off into new territory. I made up games (and I was teaching high school—unheard of!) so my students could practice skills and worked with the geography teacher to have my students use fractal reasoning and fractions to estimate the border lengths of countries they studied. This was when almost every mathematics classroom followed the same pattern: the teacher modeled the problem to be learned; students tried the examples the teacher presented; and then the teacher showed students the correct method for completing the examples. Finally, students completed thirty more problems for homework. And I had the audacity to ask students to make posters and play games? Without knowing any different or any better, in my first years of teaching I shaped my belief that mathematics could and should be fun.

## The Good Mathematics Teacher

What I did not know those first years was how complicated it truly is to be a good mathematics teacher. I engaged my students in games because that was my personality. I did not fully grasp the depth of mathematics, the conceptual understandings of mathematics, or the connections within mathematical topics or the connections mathematics has with other content areas, even though I was

a mathematics major in college. I was good at mathematics and never struggled much doing problems. How little that actually helps one be a mathematics teacher!

I had to learn classroom management while I actively engaged my students. I had to go beyond just teaching them to do problems correctly with proper vocabulary. I had to recognize and address students' differences, not pretend they didn't exist because it might hurt students' self-esteem or I found it inconvenient or harder. I have been on this quest for almost twenty-five years as a classroom teacher, a university professor, a researcher, and ultimately a mathematics consultant working with schools and districts across the United States and around the world. I have learned over the years that our struggles in effectively teaching mathematics are universal. I have worked to shape curriculum and instruction alongside excellent teachers and administrators, to whom I will always be thankful.

Teachers face more challenges in the 21st century than probably any time in history. Content is expansive and robust, and we teach diverse groups of students. Classroom structures and management are ever changing and complicated. And overriding all these challenges are the high-stakes tests that frustrate and intimidate teachers and students alike. Yet teaching in the 21st century has so many incredibly positive aspects. I am more convinced than ever that all students can become the mathematicians we long for them to become. We have more research than ever before from the fields of sociology, psychology, and cognitive science as well as education to help identify what does and does not maximize student learning and increase interest and motivation in learning mathematics. We have rigorous standards to increase learning and make us internationally competitive. We have structures to develop comprehensive and conceptual curricula and design instruction to reach all students. But how do we put this all together?

## Overview of the Book

This book is designed to break down the complex components of teaching mathematics into workable parts, with each chapter adding another layer. It provides an easy-to-read and easy-to-implement blend of research, big ideas, connections between mathematics concepts and instruction, and practical strategies and examples for K–6 classrooms.

The chapters in this book all follow the same pattern. Each chapter and many sections within the chapters begin with a vignette or scenario that provides a mental picture of what is to come. Each chapter ends with reflection questions and a call to action. The reflection questions are designed to invite readers to

make the material their own and relate it to their professional setting. The calls to action provide specific tasks that help readers take the next steps to implement the learning in each chapter. The book is designed for various professional development settings, including:

- Collegial book studies
- Mentorships between experienced and new teachers
- Individual study and reflection

To mentor the mathematical minds in your care, you must carefully develop many aspects of instruction, assessment, classrooms, and learning. You will find answers to the following questions in this book, including specific and practical examples for reflection and learning.

- **Chapter 1:** How do I get my students to work hard, struggle with problems, and persevere to keep learning? What are the components of an effective mathematical learning environment?
- **Chapter 2:** How do I hook and engage students in learning mathematics? What does that look like? What tasks are most likely to engage students while maintaining the necessary rigor? How can I make skill development and practice fun? How can I make learning social? How do I manage an active classroom?
- **Chapter 3:** How do I address all my students' differences? What does *differentiation* really mean, and how do I implement it in my mathematics classroom on top of everything else I have to do? What learning differences do I need to attend to? How do I really attend to them? What does a differentiated classroom look like?
- **Chapter 4:** What does it mean to understand mathematics? How do I use mathematical understanding to drive instruction, and how do I present that to students? What does it look like when students understand? What should students be able to model and demonstrate as they gain mathematical understanding?
- **Chapter 5:** How can I use assessment to truly further learning? What types of assessments should be present in every unit? How does assessment inform my instruction? How involved should

students be in the assessment process? How can assessments act as learning and reflection tools for students?

- **Chapter 6:** How do I begin to do all of this? What role should families play in this, and how should I communicate with them? How can I remember to keep all the pieces in balance? How can I keep my life in balance?

As we consider our changing technological world, it is critically important that our students see the value and joy in learning and applying mathematics inside and outside the classroom. Mathematics enables us to figure simple problems and decisions in everyday life and opens doors in career opportunities. However, the ultimate goal of this book is to help students learn mathematics more effectively and for teachers to increase their appreciation and love for mathematics. I hope this book becomes a go-to tool for you in planning and teaching meaningful mathematics in your classroom.